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MBA PROFESSIONAL REPORT

Military Business Success

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13. ABSTRACT (maximum 200 words)

The Small Business Innovation Research (SBIR) program was created in 1982 to stimulate research and development among small businesses while providing the government innovative technical and scientific solutions to challenging problems. In SBIR, Phase I awards are made for research projects to evaluate the scientific and technical merit of an idea. Phase II awards are made to further develop selected Phase I projects that demonstrate the greatest potential. In Phase III commercialization occurs, however no SBIR funding is available.

This research identifies and measures the variables that shape the success of the Naval Air System Command's (NAVAIR) SBIR program from the stakeholders' point of view. As different stakeholders have different perspectives on how they perceive success in this program, this study identifies the variables that shape the success of NAVAIR's SBIR program from the firms' viewpoint.

To identify the variables that shape the success of NAVAIR's SBIR program from the firms' perspective, we conducted a qualitative research. The analysis and results were generated based on the interviewees' perceptions and responses. This study concluded with the factors influencing the success of the firms in the SBIR and from the findings several recommendations were made for the SBIR program and future research.

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MILITARY BUSINESS SUCCESS

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Submitted in partial fulfillment of the requirements for the degree of

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MILITARY BUSINESS SUCCESS

ABSTRACT

The Small Business Innovation Research (SBIR) program was created in 1982 to stimulate research and development among small businesses while providing the government innovative technical and scientific solutions to challenging problems. In SBIR, Phase I awards are made for research projects to evaluate the scientific and technical merit of an idea. Phase II awards are made to further develop selected Phase I projects that demonstrate the greatest potential. In Phase III commercialization occurs, however no SBIR funding is available.

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EXECUTIVE SUMMARY

This study is part of a larger research project with the purpose of establishing the metrics and variables for the success in the NAVAIR Small Business Innovation Research (SBIR) program. The main objective of this study is to identify the factors that promote success of firms participating in the SBIR program.

The team developed a plan to gather the data and evaluate two categories of participants in the SBIR program, specifically the stakeholders that reached Phase III, and those firms that do not continue to Phase II or Phase III. The main source used to identify the firms as potential participants was the NAVAIR's SBIR program database. From this database the team searched for potential interview participants, contacted them, and later conducted the interviews by phone.

A literature review was conducted for background and details on the essence of the NAVAIR's SBIR program. Variables that could influence entrepreneurial success were identified and a theoretical model of success was built. A qualitative analysis was used to gather data and the results were obtained by using the thematic approach. By analyzing the data, the team examines the success of NAVAIR's SBIR program from the perspective of the stakeholders and how they look at the different success criteria.

Finally an analysis and results were generated based on the interviewees' perceptions and responses. This report concluded with the factors influencing the success of the firms in the SBIR. From the findings, several recommendations were made for the SBIR program and future research.

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I.   INTRODUCTION

A.   INTRODUCTION AND BACKGROUND

1.   Introduction

The government-sponsored Small Business Innovation Research (SBIR) program was created in 1982 to stimulate research and development activity among small businesses while providing the government innovative technical and scientific solutions to challenging problems. SBIR awards support the development of technology with commercial applications throughout the United States.

Ten government agencies, including the Naval Air System Command (NAVAIR), the Departments of Defense, Energy, Agriculture, Education, Transportation, and NASA reserve a portion of their research and development budget for SBIR contract awards to small businesses. Commercialization of products to support the war-fighting mission represents an important goal of the NAVAIR SBIR program.[1] (Naval Air Systems Command [NAVAIR], 2000)

This research is part of a larger study that identifies and measures the variables that shape the success of NAVAIR's SBIR program from the stakeholders' point of view — the firms in the SBIR, the Program Managers (PM) in NAVAIR, and the SBIR management. The goal of this research is to identify the factors that create success of the firms that have won awards in the NAVAIR SBIR program.

2.   Background

NAVAIR is part of the Department of the Navy. NAVAIR competencies include Program Management, Contracts, Logistics Research & Engineering, Test & Evaluation, Industrial Operations, Corporate Operations and Shore Station Management.[2] (NAVAIR, 2004)

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1 Naval Air Systems Command. Retrieved April 02, 2004 from
http://www.house.gov/science/wessner_061799.htm

2 Naval Air Systems Command. Retrieved April 02, 2004 from
http://www.navair.navy.mil/index.cfm?fuseaction=organization.default

The Small Business Innovation Development Act (Public Law (PL) 97-219) established the SBIR Program within NAVAIR in 1982. It is the primary vehicle through which the federal government funds small technology companies to perform research and development (R&D) projects.[3] (Navy Small Business Innovation Research [NSBIR], 2004). The program's main objectives are to stimulate technological innovation, promote small business in meeting Department of Defense (DoD) R&D needs, encourage minority and disadvantaged persons to participate in technological innovation, and increase the commercial application of DoD supported R&D results. The SBIR program has three phases.

Phase I is a feasibility study that determines the scientific, technical, and commercial merit and feasibility of a selected concept. Phase I projects are competitively selected from proposals submitted against annual solicitations called a topic call. Each topic call contains specific requests to solve technical problems.

Phase II represents a major research and development effort, culminating in a well-defined deliverable prototype (a technology, product, or service). The Phase II selection process is also highly competitive. Successful Phase I contractors are invited to submit Phase II proposals, as there are no separate Phase II solicitations. Approximately 40% of Phase II proposals are selected for award.

In Phase III, the small business or research institute is expected to obtain funding from the private sector and/or non-SBIR government sources to develop the prototype into a viable product or service for sale in the military or private-sector markets.[4] (The Army Research Office [ARO], 2004)

In essence, Phase I awards are made for research projects to evaluate the scientific and technical merit of an idea. Phase II awards are made to further develop selected Phase I projects that demonstrate the greatest potential. In the third phase, commercialization occurs. However no SBIR funding is available for Phase III.

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3 Navy Small Business Innovation Research.. Retrieved April 02, 2004 from
https://sbir.navair.navy.mil/ov_main.htm

4 The Army Research Office, SBIR/STTR Programs - A User's Guide. Retrieved April 10, 2004 from
http://www.aro.army.mil/arowash/rt/sbir/progguide.htm

B. THESIS OBJECTIVE(S)

This study is part of a larger research project with the purpose of establishing the metrics and variables for the success in the NAVAIR SBIR program. These metrics and variables concern different stakeholders with various perspectives of success in the SBIR program.

The thesis objectives are to study the factors that promote success of firms participating in the SBIR program by analyzing records and interviewing SBIR award winners. This study also examines what topic calls' characteristics lead to success in the SBIR program from the firm's point of view.

The thesis objectives are also to provide data that identify any problems concerning the SBIR program at NAVAIR.

C. RESEARCH QUESTION

Our research question is

- What variables contribute to the success of the participating firms in the SBIR program?

D. SCOPE

Our study intends to identify and to measure the variables that shape the success of NAVAIR's SBIR program from the stakeholders' viewpoint, namely the firms and the program office. The identified variables could be used later in a quantitative study to identify metrics for success in the SBIR program. This study is focused on the qualitative findings and not the quantitative aspects. Therefore, the taken samples are only from the firms and not from the other stakeholders.

E. METHODOLOGY

To identify and measure the variables that shape the success of NAVAIR's SBIR program from the firms' perspective, we conducted a qualitative research program. We did a literature review to identify the potential variables that could influence success. We studied records of all firms participating in the SBIR in 1998. From the NAVAIR's SBIR

program database, potential interview participants were identified. The team contacted them for their willingness to collaborate, and later conducted the interviews by phone. We interviewed a representative sample of firms that had successfully reached Phase III in the SBIR program. On completion of the interviews, the samples were transcribed and subjected to qualitative comparative analysis. The results are used to identify the variables that represent the main factors leading to the success in NAVAIR's SBIR program.

F.   ORGANIZATION OF THE STUDY

This report contains six chapters covering our research related to the firms SBIR success.

Chapter I includes the introduction, background, thesis objectives, research, questions, scope, methodology and organization of study.

Chapter II provides a background and details on the essence of the NAVAIR's SBIR program and identifies stakeholders of interest. It also provides a theoretical model of the different perception of success among the stakeholders.

Chapter III identifies the variables that could influence entrepreneurial success and the potential impact of military culture in the SBIR environment.

Chapter IV describes the methodology of this study. We present the questionnaires used to conduct the interviews with participating firms.

Chapter V presents and analyses the results of the study.

Chapter VI describes the conclusion and limitations and makes recommendation for the SBIR program and future research.

II. SMALL BUSINESS INNOVATION RESEARCH (SBIR) NAVAL AIR SYSTEMS COMMAND'S (NAVAIR) PROGRAM AND ITS STAKEHOLDERS

A. SMALL BUSINESS INNOVATION RESEARCH

The government-sponsored Small Business Innovation Research (SBIR) program was initiated in 1982 to stimulate research and development activity among small businesses while providing the government innovative technical and scientific solutions to challenging problems.

SBIR also promotes technology transfer by sharing knowledge and facilities among federal laboratories, industry, universities, government, and others to make federally generated scientific and technological advances accessible to private industry and to state and local governments.

Ten federal departments and agencies set aside a portion of their research and development budget for SBIR contract awards to small businesses. Among them are

- Department of Agriculture;

- Department of Commerce;

- Department of Defense;

- Department of Education;

- Department of Energy;

- Department of Health and Human Services;

- Department of Transportation;

- Environmental Protection Agency;

- National Aeronautics and Space Administration;

- National Science Foundation.

The SBIR program provides up to $ 850,000 in early-stage R&D funding directly to small technology companies (or individual entrepreneurs who form a company).[5] (Department of Defense: SBIR/STTR/Fast Track – Main Web page, 2004)

To participate in the SBIR program:

- A firm must be a U.S. for-profit small business of 500 or fewer employees;

- Work must be performed in the United States;

- During Phase I, a minimum of two-thirds of the effort must be performed by the proposing firm: a minimum of one-half of the effort in Phase II;

- The Principal Investigator must spend more than half of the time employed by the proposing firm.

Eligibility is limited to for-profit businesses that qualify as a small business concern. Eligible companies include sole proprietorships, partnerships, joint ventures, associations or cooperatives. Nonprofit organizations are not eligible.[6] (Small Business Administration [SBA] Web page, 2004)

While large corporations and Venture Capital-owned companies have a tremendous advantage in pursuing large federal contracts, the SBIR program was designed to create a level playing field for which small businesses might compete with large corporations.

The primary employment of the principal investigator must be with the small business. He or she must spend more than one-half of his or her time employed by the small business at the time of award and during the conduct of the effort.

Each year federal agencies identify various topics specifically for the SBIR program. These topics represent serious scientific and technical problems requiring innovative solutions. Contracts are awarded competitively based on scientific and technical merit. Scientists and engineers who are well versed on the topic area evaluate

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5 Retrieved April 03, 2004 from http://www.acq.osd.mil/sadbu/sbir/homepg.htm
[6] Retrieved April 03, 2004 form http://www.sba.gov/opc/pubs/sbirproposalprep.pdf

proposals. Special emphasis is given to the innovative approach and the qualifications of the principal investigator as well as the commercial potential of the proposal. [7] (Fleet and Industrial Supply Center Web page, 2004).

NAVAIR as a government agency also takes an active part in the SBIR program by providing new technologies and products for the NAVY. It is one of the NAVY SBIRs. In doing so, they follow a mechanism of interaction among the main stakeholders which has the objective of achieving final success by selecting and verifying the firm competitors for the awards at the different phases. Among the other components of the DoD SBIR, the NAVY comprises about 22.0% (Figure 1)[8]
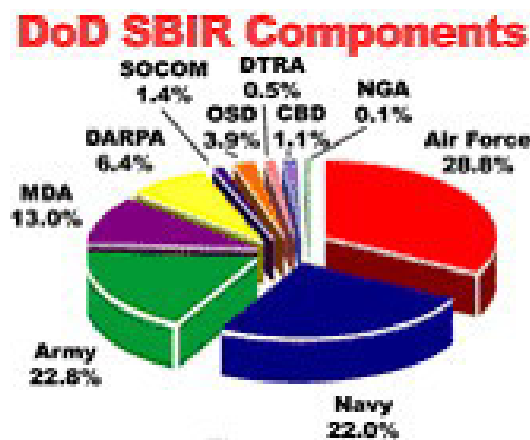
Figure 1.   DoD SBIR Components (After: Department of Defense, SBIR/STTR Fast Track Web Site)

1. Background

The NAVAIR vision is to provide cost-wise readiness and dominant maritime combat power to make a great NAVY/Marine Corps team better. Its goal is to balance current and future readiness. [9] (NAVAIR Web page, 2004)

Figure 2 below shows the step-by-step process in NAVAIR's SBIR program in the context of the created mechanism.

While some of the firms participate at Phase I in the NAVAIR's SBIR program, other companies are at Phase II or III respectively. Some companies participate for the

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[7] Retrieved April 03, 2004 from http://www.jax.fisc.navy.mil/Services/SmBusiness/SB101/PartI/SBIR.htm
[8] Retrieved April 12, 2004 from http://www.acq.osd.mil/sadbu/sbir/overview/index.htm#sbir
[9] Retrieved April 02 2004 from http://www.navair.navy.mil/index.sfm?fuseaction=about.default

first time in the program while others enroll consecutively aiming at the financial and other benefits. Basically the three phases include different time periods (Table 1).

The requirements at the Phase I, II and III are different and represent a challenge both for NAVAIR and the selected firms.
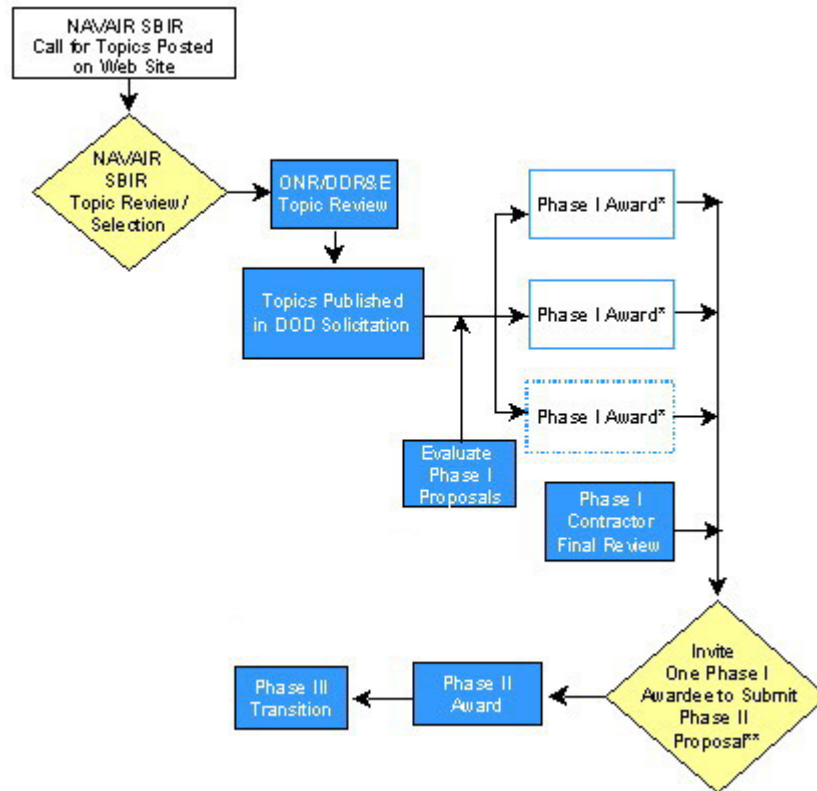
Figure 2.   NAVAIR SBIR Process[10] (After: NAVAIR Small Business Innovation Research Web page)

Phase	Objective	Award
Phase I	Project feasibility	Six months up to $ 100,000
Phase II	Prototype	Two years up to $ 750,000
Phase III	Commercialization	Commercialize, with non-SBIR funds, the technology in military and/or private sector markets

Table 1   Phases in the NAVAIR SBIR Process (After: NAVAIR Small Business Innovation Research Web page)

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[10] Retrieved on April 12, 2004 from https://sbir.navair.navy.mil/ov_process.htm

a. Phase I

NAVAIR's SBIR Phase I funds applications for high-cost advanced technology, clinical research or studies for up to two years. Any SBIR Phase I recipient may apply for an advanced technology Phase II grant.

Phase I Proposal Evaluation

At the NAVAIR Systems Command, Phase I proposals are evaluated by a team of at least three engineers or scientists who are knowledgeable in the topic area. Proposals are first evaluated on their relevance to the chosen topic. A proposal that meets the goals of a solicitation topic, but does not use the exact approach specified, will be considered relevant. Results will be posted on this web site as each topic team completes its evaluation and makes its selection. Naval Aviation topics that are found to be relevant are evaluated using the criteria listed in the solicitation. Where technical evaluations are essentially equal in merit, the evaluation team will consider the cost to the government in determining the successful bidder. 11 (NAVAIR Home Web page, 2004)

b. Phase II

NAVAIR funds Phase II awards for up to three years and $1 million. Both phases may request higher than usual consultant costs.

(1)   Phase II Proposal Evaluation

Phase II proposals are evaluated in accordance with the criteria below:

•   Soundness, technical merit, innovation of the proposed approach and its incremental progress toward topic call or subtopic solution;

•   Qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the R&D, but also the ability to commercialize the results;

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11 Retrieved March 31, 2004 from https://sbir.navair.navy.mil/p1_eval.htm

- Potential for commercial (government or private sector) application and the benefits expected to be gained from this commercialization.

Final decisions are made based on scientific and technical evaluations and other factors, including:

- Sponsor need;
- A commitment for Phase III follow-on funding;
- Possible duplication with other research or R&D;
- Program balance;
- Budget limitations;
- Potential of a successful Phase II effort leading to a product of continuing interest to Naval Aviation.

c. **Phase III**

- The eligibility criteria of the firms for Phase III include:
- Technology must be broad and useful to multiple military customers.
- Small business must have a Phase II contract in process or completed.
- Must have a Naval Aviation sponsor plus at least one other government sponsor interested in funding a Phase III.

Phase III Proposal Evaluation

Formally, SBIR programs have a third phase. Where appropriate Phase III is conducted by the small business (including joint venture or R&D partnerships) to pursue commercial applications of the R&D conducted in Phases I and II. Non-federal funds are used, including those obtained by exercising the follow-on funding commitment production contracts with a federal agency for products or processes intended for use by the United States government. The reason for this is that Phase III is not funded by the government.

B. STAKEHOLDERS – SCALES OF SUCCESS

The stakeholders within the NAVAIR's SBIR program are the small business firms, the SBIR department at NAVAIR and the program manager (PM).

The difference in perception of success is a result of the different objectives for the stakeholders in the process. The goal oriented approach characterizes PM and SBIR who are interested in a particular outcome, while the firms strive to achieve one of their short term objectives that will lead them to long term technological or production superiority on the market. Analyzing the incentives of the stakeholders in the process, we assumed therefore that success has different dimensions for the mentioned parties. Thus we built the following models concerning the interactions in the program that lead to military business success. (Figure 3 & 4)
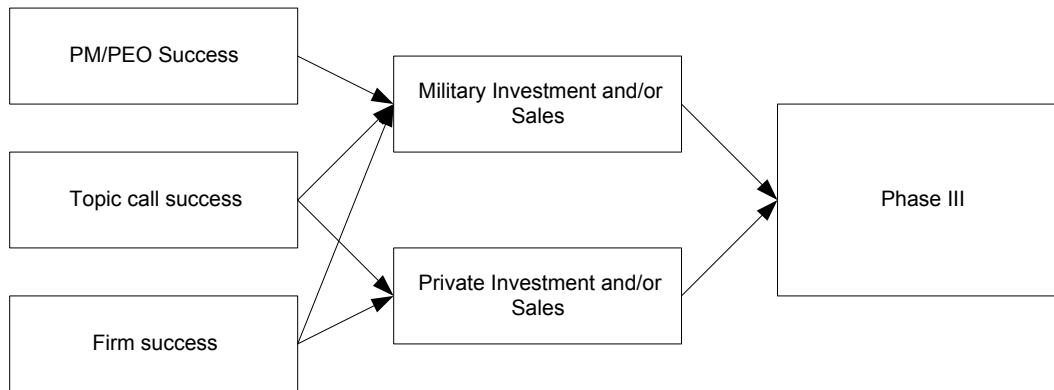
Figure 3.   Influence of Stakeholders' View of Success on Achieving Phase III in the NAVAIR SBIR Program.

1.   Small Business Firms

Firms view success as achieving the corporate objective. This objective could be directly pointed to improving an existing process/technology/product or developing a new one that will be commercialized and will increase their market share, sales, profit and will contribute to the further growth of the firm. In the NAVAIR's SBIR context, the objectives are usually related to Military Investment and/or Sales and Private Investment and/or Sales (Figure 3).

Many firms participating in the SBIR program could be an example of achieving their corporate objective. Here is an example of a company for the period (1995-1998):

Because of the quality and reliability of MIOX's water purifying technology developed under SBIR, the company has sold hundreds of units. MIOX grew to $1.5 million in sales by the end of its second year in business (1995) and is expected to see double this level of revenue in 1998. Recognized as the second major competitor for disinfection equipment by the largest and fastest growing water treatment company in the world, MIOX is certain to see continued rapid growth.[12]

Small business companies can consider themselves as successful despite the fact that they do not continue to Phase II or III, as they might have used the award grants to finance their R&D to a level that meets their corporate objective.

2. SBIR Department at NAVAIR

SBIR views success in achieving Phase III as the main goal. This occurs because the practical implications of this phase solve the primary needs of the NAVY related to the initiation of the specific topic call. Therefore NAVAIR's SBIR point of view toward firms not continuing to Phase II or III can define them as unsuccessful or less successful companies. This, of course is not the same way firms perceive success as we have mentioned above. Despite the differences in success perception, both successes can contribute to achieving Military Investment and/or Sales. (Figure 3)

3. Program Manager (PM)

PM views success as a successful completion of a topic call. Therefore his/her objective is to use the right technology to find a solution to the identified problem by the topic call (Figure 4). His/her perception does not include what is basic for the firms – the right price and the right time for the market but their common goal is developing a technology that can be used.

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[12] A DoD SBIR Success Story, retrieved on May 12, 2004 from
http://www.dodsbir.com/Materials/SuccessStories/Miox.htm
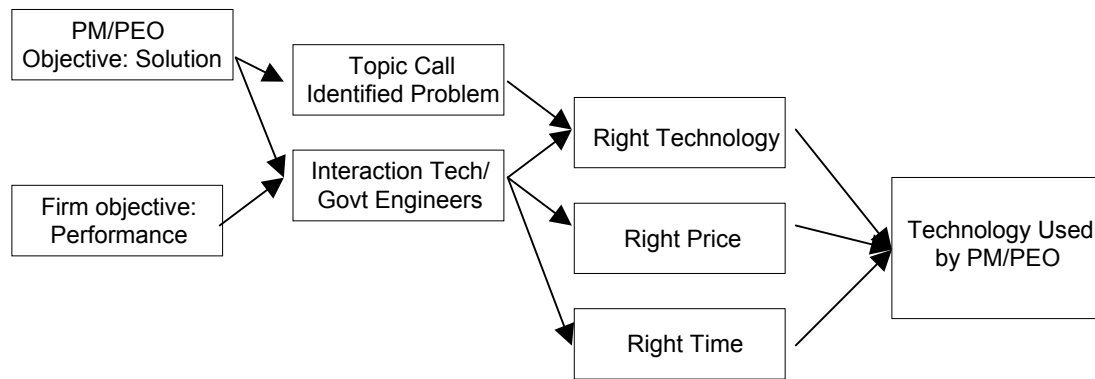
Figure 4.   PM/PEO and Firm's Objective Interaction in the NAVAIR SBIR Program.

Thus, the stakeholders have different views for success that can be partly explained by their different incentives and interests, partly also by the existing culture within the organization that can influence not only every decision but can also shape the working environment and traditions.

To discover the influence of culture on success we will further clarify the above mentioned statement by analyzing of entrepreneurial success and culture.

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III. ENTREPRENEURAL SUCCESS AND CULTURE

A. ENTREPRENEURAL SUCCESS

1. Overview

In clarifying the necessary traits and skills that a firm requires to accomplish the goals of NAVAIR, we analyze what entrepreneurial success means and how it affects the firms participating in the NAVAIR's SBIR program. This will help us make initial assumptions about how entrepreneurial success shapes the overall military business success in the program.

Entrepreneurial success in small business firms is crucial for the survival of these firms. Without it, firms wither and disappear at the beginning of their life cycle. It is the SBIR programs that "fund research and development efforts of a high risk nature that may have excellent commercial potential."[13] (Small Business Administration [SBA], 1995)

Therefore the SBIR program provides opportunities for entrepreneurship to small business firms. But each firm takes advantage of these opportunities differently. Some pass only Phase I; others reach only Phase II, and others are awarded in Phase III. The reasons for different outcomes can be the firms themselves and their spirit of entrepreneurship.

2. What is Entrepreneurship?

According to a study made by Cooper, Woo & Dunkelberg in 1988, more than half of new ventures failed within a few years of their founding (Cooper, Woo & Dunkelberg, 1988). Other ventures however managed to achieve major success and end up with vast wealth and assets. One might ask then what primary factors lead these firms to success. In this study, we answer this complex question by considering a few hypothesized variables. Some of these factors are external to these companies and others are mostly economic in nature. For instance, there are new ventures, which depend heavily on the states of the economy and the capital market. Shane and Venkataraman

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[13] *SBIR Proposal Preparation Handbook*, March, 1995. Retrieved April 25, 2004 from
http://www.sba.gov/library/pubs.html#co0028

look at entrepreneurship as emerging opportunities from a complex interplay between societal and economic factors, which are identified by certain individuals who then convert the opportunities into tangible benefits.[14] (Shane, S., & Venkataraman, S., 2000)

Previous analyses also show that owners of entrepreneurial firms and their leading managers are more important for the firm's success than anything else as they shape the outlook of the organization by hiring the right employees, building the right structure for their ventures, and making the right decisions. All of this is based on an adopted business strategy that is more or less part of a business plan. "Good business strategy is guided by a simple maxim: Know your own business."[15] (Small Business Administration Web page, [SBA], 1995) And knowing your own business means to be deeply involved in the matters of the firm.

3.   Common Characteristics of Entrepreneurship

Successful entrepreneurs possess certain common characteristics. According to the opinion of 50 businesswomen interviewed by the Ontario Department of Industry and Commerce, "success is mainly a question of personal qualities." [16] (The Business Link, Business Service Center, 2004)

The most significant success factors in this survey are shown below and also illustrated in Figure 5. The percents are derived from the responses:

- Determination 43.8%;

- Love of Risk 18.7%;

- Leadership 12.5%;

- Love of Success 10.4%;

- Personality 10.4%;

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14 Shane, S. & Venkaraman, S. (2000). "The Promise of Entrepreneurship as a Field of Research." *Academic of Management Review*, 25, pp. 217-226

15 SBIR *Proposal Preparation Handbook*, March, 1995. Retrieved April 25, 2004 from http://www.sba.gov/library/pubs.html#co0028

16 The Business Link, Business Service Center, Retrieved April 24, 2004 from http://www.cbsc.org/alberta/tbl.cfm?fn=cutout&pf=1

- Creativity 6.2%.

The same survey also states the reasons for starting a business:

- Seize an Opportunity 17%;

- Personal Accomplishment 13%;

- Dream to Run Own Business 9%;

- Use Experience/Skills 9%;

- Be One's Own Boss 8%;

- Economic Necessity to Make a Living 7%;

- Had Previous Experience 7%;

- To Supplement Income with Another Employment 5%;

- Create a Job for One's Self 4%;

- Frustrated in Previous Job 3%;

- Make Lots of Money 3%;

- Other Reasons 15%.

These motives along with the other data from Figure 5 indicate the strong feelings of determination and risk taking – important factors for a new venture establishing itself on the market.
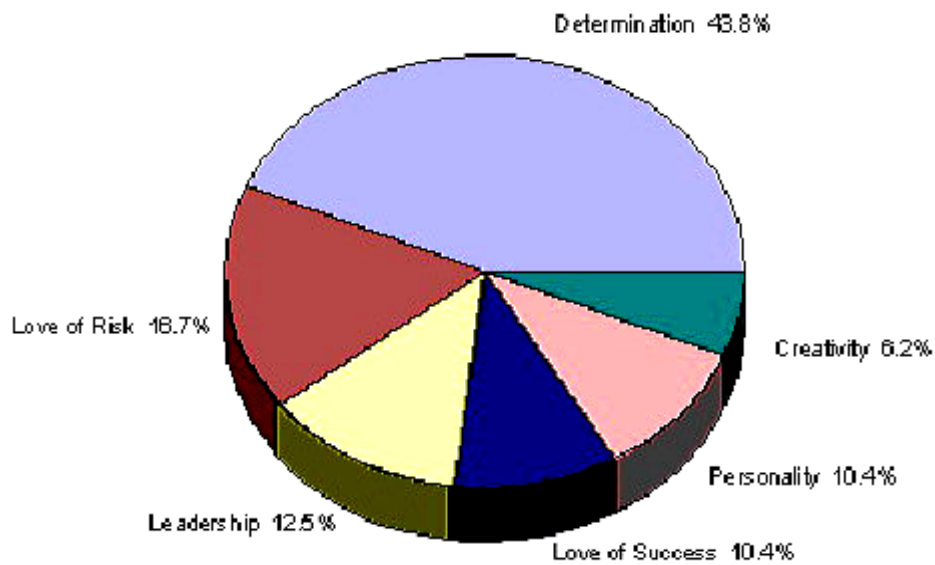
Figure 5.   Breakdown of Important Personal Qualities (After: The Business Link, Business Service Center)

According to Peter Wylie and Mardy Grothe, "entrepreneurs are not necessarily adept at making a business work or managing people"[17] (Nelton S., 1992)

They point out ten key threats to the success of a business:

1. Not knowing how to manage and operate a business;

2. Lack of cash;

3. Growing too rapidly;

4. Poor interpersonal relationships;

5. Lack of strategic planning;

6. Failure to innovate;

7. Trying to make it alone;

8. Poor communications;

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[17] Nelton, Sharon. *Nation's Business*. Washington: Chamber of Commerce of the United States Jun 1992. Vol. 80, Iss. 6; pg. 18

9. Failure to recognize one's own strengths and weaknesses;

10. Failure to seek and respond to criticism.

As recommendations on how to evade these key threats, other economists suggest ten quite relevant imperatives[18] (Small Business Administration Web page, [SBA], 2004):

1. Know yourself.

2. Plan your business.

3. Finance for the long term.

4. Balance your books.

5. Practice good management.

6. Know your market.

7. Deliver quality.

8. Hire the right people.

9. Choose the right location.

10. Don't be afraid to ask for help.

All of the above recommendations are useful but seem rather generic. They do not reflect advice that can be used in the specific SBIR environment but rather help us identify some of the key variables of success by eliminating the threats.

It is risky to operate a small business and according to Nelton, the willingness to take a risk is a requisite of entrepreneurs and a manager can be "extraordinarily creative or a high-tech genius, but that's not enough." (Nelton S., 1992)

For example four of the key threats - poor interpersonal relationships, trying to make it alone, poor communications and failure to seek and respond to criticism are overall a direct consequence of the level of *entrepreneurs' communicability.*

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18 *Winning Ideas for Small Business Success.* Small Business Administration. Retrieved on April 24, 2004 from http://www.sba.gov/gopher/Business-Development/Success-Series/Vol1/Win1/winall.txt

Communicability refers to the skill to empathize and to communicate with others, such as employees, customers, and suppliers. Nelton also made some perceptive and more specific insights about how to prevent the above threats:

> *Most privately held businesses don't spend enough time evaluating people before hiring them, he says... Entrepreneurs often 'just do not have a clue as to how to have a reasonably good relationship with the important people that they have to interact with on a day-to-day basis, whether we're talking customers, partners, or employees,' says Peter Wylie... Business owners resist strategic planning because they think they don't know how to do it, can't afford it, and don't have the time, according to Allen Fishman. Unsuccessful business owners prefer to do everything themselves.... The better you know yourself, the better your chance of avoiding problems and nurturing your company to further growth. When people do give you honest feedback, don't get angry at them... So, entrepreneurs make mistakes. But those who are smart correct errors before their businesses sink. (Nelton S., 1992)*

Wylie and Grothe's ten threats to a business success illustrate poor leadership and inadequate interpersonal skills.

The lack of strategic planning and the failure to recognize one's own strengths and weaknesses illustrate the significance of having a good *market orientation* and *learning orientation*. Without a good orientation of the market and the ability to learn from one's weaknesses and strengths, it is impossible to identify a robust strategy that can bring success. Goodman notes that "successful entrepreneurs don't have failures. They do have learning experiences."[19] (Goodman, J.P., 1994)

Learning experience can trigger innovation by clarifying which areas must be improved to meet the market demand. Failing to innovate undermines entrepreneurial success and ironically benefits the existing or emerging competition, according to Gary Hamel, the world's leading innovation expert:

> *Somewhere out there is a bullet with your company's name on it. Somewhere out there is a competitor, unborn and unknown, that will render your strategy obsolete. You can't dodge the bullet. You're going to*

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[19] Goodman, Jon P, "What Makes an Entrepreneur", *On Campus, University of Southern California, Inc*; October 1994; 16, 10; ABI/INFORM Global, p. 29

have to shoot first. You're going to have to out-innovate the innovators. [20]
(Innovation@work web site, 2004)

In the context of the small business firms in SBIR, a National Science Foundation analysis reveals that "small business has been a more prolific source of innovation per research and development dollar than a large business."[21]

Innovations are related to the needs of the market for new products or services and normally whoever is faster establishes a greater market share. Therefore *innovativeness* is crucial for the survival of some small businesses. A good trait related to this is that "Most entrepreneurs starting out on their own have the ability to keep their ear closer to the ground or to be closer to the consumer and to define their own niche." (Nelton S., 1992)

Nelton suggests that the first weakness – not knowing how to manage and operate a business – can be overcome through education. Therefore this feature is not significant to our study concerning the NAVAIR's SBIR environment because we assume that the stakeholders are rational in their behavior and secure appropriate education.

Education is not the only prerequisite for a successful firm. Communication is often neglected as an important ingredient.

> *When small businesses fail, the wreckage is often assigned to undercapitalization, among other mistakes. Seldom is failure attributed to a lack of effective communications that might have modified the behavior of sales prospects in a positive way, thus averting bankruptcy.* [22] (Kelly R.A., 2004)

As far as the small business firms in SBIR are concerned, they obtain sufficient financing for their research and development from SBIR and thus the threat from this factor can be diminished. *Communicability,* however, remains as an important success feature.

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[20] Innovation@work, Retrieved on June 10, 2004 from
http://www.audiotech.com/I@W/Course/compelling.htm

[21] Winning Ideas for Small Business Success, Retrieved on April 24, 2004 from
http://www.sba.gov/gopher/Business-Development/Success-Series/Vol1/Win1/winall.txt

[22] Kelly R. A., Public Relations: Antidote for Small Business Failure, The Business Forum Online,
Retrieved on April 24, 2004 from http://www.businessforum.com/rak01.html

Thus, from the above, we see that the variables that can contribute to entrepreneurial success are *innovativeness, entrepreneurs' communicability, market orientation* and *learning orientation*. These variables therefore need further clarification.

a. Innovativeness

There is a positive relationship between entrepreneurial orientation and performance (Covin & Slevin, 1991; Lumpkin & Dess, 1996, 2001; Miller & Friesen, 1984; Smart & Conant, 1994).[23] We hypothesize that the innovativeness dimension of PM contributes to the PM-performance relationship (along with communicability). Innovativeness and creativity are related. Harnessing creativity leads to innovation. This can involve combining different objects in different ways to produce new products and discovering new purposes for products (Kropp, Lindsey, Noel & Shonam, 2003). It can also involve discovering better ways to solve customer problems.

Entrepreneurs tend to be non-conventional, creative, lateral thinkers, who can think outside the box, who can identify innovative business opportunities, and who are adept at adapting to changing and uncertain environments. In more volatile situations, more creative and innovative firms tend to outperform other firms. (Kropp, Lindsey, Noel & Shonam, 2003)

Since innovativeness is essential to overcome the obstacles that threaten the new firm's existence, firms that are more innovative will outperform those with lower levels of innovativeness.

b. Communicability

Communicability is essential for networking and team development in early stage ventures. Although communicability is important for many businesses, it is especially important for military business success. It provides the cohesion to move the firm forward during a turbulent and uncertain stage in its life. In early stage ventures when resources are scarce and job descriptions are evolving, a failure to communicate effectively – particularly by the lead entrepreneur – can lead to work inefficiencies,

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[23] Kropp, Frederic, Lindsay, Noel J. and Shoham, Aviv, (2003). "The New Entry Decision and Performance Determinants in Early Stage Entrepreneurial Business Ventures: Synthesizing Entrepreneurial, Market, and Learning Orientations," Executive summary, Working Paper, p. 4

duplication, wasted resources, a disaffected team failing to embrace the vision, and possible failure.

Prior research supports a broad association between communicability and performance. In general, human and organizational competencies affect the performance of business ventures and personal contacts are important in business development. Having well-developed social networks ("know-who") improves one's ability to access information and obtain assistance to grow the business. Strong communication skills, greater self-confidence, and resourcefulness play a crucial role in this regard. New firms are particularly susceptible to business failure for several years after startup and need to work harder to surmount the problems of newness (Kropp, Lindsey, Noel & Shonam, 2003). It is imperative to develop communication channels with customers, suppliers, and the team. Their ability to achieve this will help businesses obtain and avoid squandering necessary resources.

c. *Market Orientation*

Market orientation measures the marketing focus of the firm. Market-oriented firms recognize and respond to changes in consumer needs and to competitive moves made by other firms in their industry. Research has established a link between market orientation and firm performance. Scholars such as Deshpande, Farley, Webster, Jaworski, Kohli, Kumar, Narver, Slater, Pelham and Wilson confirm this (Kropp, Lindsey, Noel & Shonam, 2003). Market orientation is important to firms because it captures their ability to anticipate, address and capitalize on market changes in customer needs that enhances performance. Market-oriented firms capitalize on these changes leading them to superior performance compared with less market-oriented firms. Three theoretical explanations underlie the positive link between market orientation and performance.

First, Lusch & Luczniak's (1987) evolutionary perspective suggests that higher market orientation strengthens performance (Kropp, Lindsey, Noel & Shonam, 2003). Characteristics that make a firm fit its environment become a part of its future evolution only when replicated. Such a replication is achieved through market orientation, which can provide the firm with a winning strategy. Market orientation will

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be selected because it contributes to the firm's performance. Accordingly, market orientation and a firm's performance are positively related.

Second, the industrial economy can explain the link between market orientation and performance. The tighter the fit between the firm's strategy and its environment, the stronger its performance.

According to a resource-based firm's perspective different resources can give rise to various strategies and subsequently can affect performance. When a firm's resources are durable, non-transparent, non-transferable, and/or non-replicable, they foster performance. (Kropp, Lindsey, Noel & Shonam, 2003). Resourceful firms develop market-oriented strategies and have a greater market orientation. This, in turn, improves the firm's performance.

d.   *Learning Orientation*

Organizational learning is the development of new knowledge or insights that can potentially improve behavior (Kropp, Lindsey, Noel & Shonam, 2003).

A characteristic of Entrepreneurial Business Ventures (EBV) is entry into markets with new or existing goods/services. A learning organization is one "skilled in creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (Kropp, Lindsey, Noel & Shonam, 2003). It is one in which individual learning is facilitated and encouraged with an added emphasis on sharing such learning across different units of the organization. Organizational learning serves as a buffer between firms and their environments. Learning is forward-looking; it reduces the impact of major environmental jolts. Learning organizations maintain close contacts with the stakeholders including customers, suppliers, and lawmakers, thereby elevating their ability to deal with unexpected environmental changes. The ability of a firm to learn from its experiences is an important determinant of its performance. Improved performance involves understanding and satisfying the expressed and latent needs of customers. Learning enables the firm to target and to enter new markets and improve performance (Kropp, Lindsey, Noel & Shonam, 2003). Learning orientation, therefore, will be associated with entrepreneurial success.

The above identified variables do not stand alone in their significance as they are very much influenced by the organizational culture in their manifestations.

B.   CULTURE

Culture has always been important to understand the incentives hidden behind existing processes. It is an imperative that shapes the perceptions of an individual about the surrounding environment and identifies one's moral values that lead to certain traditions and rational behavior. That is the reason culture is important in understanding the mechanisms leading to military business success.

1.   Definition

Basically, culture is "to the organization what personality is to the individual – a hidden, yet unifying theme that provides meaning, direction, and mobilization" (Kilmann and associates).[24] Culture is comprised of "such things as shared values, beliefs, assumptions, perceptions, norms, artifacts, and patterns of behavior." (Ott, J.S., 1989)

Members of an organization soon come to sense the particular culture of an organization. Culture is difficult to define distinctly, but people know it when they sense it. For example, the culture of a large, for-profit corporation is quite different from that of a hospital that is quite different from that of a university. You can tell the culture of an organization by looking at the arrangement of furniture, what they boast of, what its members wear, and so on. This is all similar to what one relies upon to evaluate a person's personality.

Corporate culture can be looked at as a system. Inputs include feedback from its constituents, namely, society, professions, laws, stories, heroes, values on competition or service, etc. The process is based on one's assumptions, values and norms, which may include one's values on money, time, facilities, space and people.

Culture drives the organization and its actions. It is somewhat like "the operating system" of the organization. It guides how employees think, act and feel. It is dynamic and fluid, and it is never static. A culture may be effective at one time, under a given set of circumstances and ineffective at another time. There is no generic good culture.

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[24] Ott, J.S., *The Organizational Culture Perspective*, Richard D. Irwin, Inc., 1989, chapter 1, p. 1

Military culture is a very specific and atypical culture. It is rooted in the long-standing traditions and norms of the Armed Forces. In order to fight and win wars, military culture demands discipline, respect for authority, sacrifice, loyalty, and teamwork.[25](Hillen, J., 1999)

The military culture is goal oriented and centered on accomplishing a mission to the exclusion of almost all other objectives because "the existence of the military profession presupposes conflicting human interests and the use of violence to further those interests."[26] Instant and willing obedience to orders is the required norm. Thus, the cultures are different in the corporate organizations and in the military. The basic differences derive from the goals, objectives and values.

Business organizations being interested in commercial success are profit driven whereas military organizations focus on implementing the political objectives through the use of persuasion or force.

2.   Is Culture Relevant to the Military Business Success in the SBIR?

In our specific case of interaction between business and military, both parties have interest in being more knowledgeable about the ruling mechanisms in the partner's organization.

As NAVAIR is in the role of a customer who requires specific technology or devices, the small business firms in SBIR have the incentives of being more flexible in order to operate in accordance with the military specifications. Clearly military specifications impose higher requirements on devices or products used by the military in conditions far different from the private sector. That is the reason technology and the overall products that target the military must be more reliable than their common commercial substitutes on the wide market and as a consequence tend to be more expensive.

The above derived and hypothesized variables serve to build the following model of military business success (Figure 6). This model explains the interaction of the main

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25 Hillen, J., (Autumn, 1999), *Must US Military Culture Reform?* Parameters, vol. 29 no.3, p.10

26 Huntington, Samuel P., The Soldier and the State, The Theory and Politics of Civil – Military Relations, The Belknap Press of Harvard University Press, 1985, pp. 62-63

factors leading to success that are to be used to construct the further qualitative research in this study.

Figure 6.   Military Business Success Model
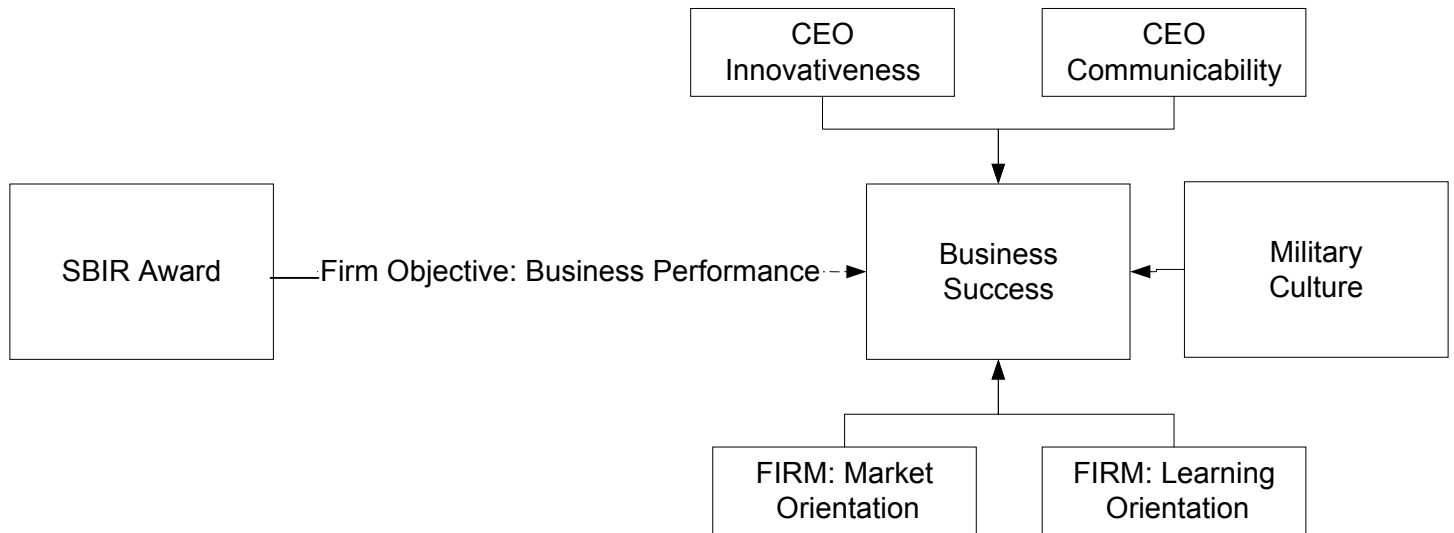
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IV.   METHODOLOGY

In this research a qualitative study was used to gather data. A thematic analysis was used to analyze the data collected.

To understand the success of NAVAIR's SBIR program from the perspective of the stakeholders, this study examines how they look at the different success criteria from bidding for awards in Phase I and Phase II to the commercialization of the SBIR product in Phase III. The goal of this research is to determine what influences the firm's success in Phase III where the commercialization occurs. Aspects such as SBIR experience, commercial experience, challenges in the SBIR program, and military experience are considered.

A.   PARTICIPANTS

To examine these criteria, the team developed a plan to gather the data and evaluate two categories of participants in the SBIR program. These categories of stakeholders are involved in the SBIR program as follows:

- Firms that reached Phase III;

- Firms that do not continue to Phase II or Phase III.

The team searched NAVAIR's SBIR program database for potential interview participants, contacted them for their willingness in collaboration, and later conducted the interview by phone.

The main source used to identify the firms as potential participants was NAVAIR's SBIR program database. A list of potential respondents was developed from identified firms that had been awarded both Phase I and Phase II of the SBIR program in 1998. From the database, 67 firms were initially identified as potential participants and five were selected. The research team first contacted the potential participants by telephone to determine their willingness to collaborate in the interview. All of the five initially selected companies agreed to participate. Upon receipt of consent, telephone interviews were conducted.   The thesis advisor assisted the research team in the interviewing process.

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B.   DATA GATHERING

A questionnaire was developed to conduct personal interviews with each of the identified target groups of stakeholders. This questionnaire was designed to gain individual perspectives from the target groups involved in the SBIR system. (See Table 2) In this research the firms were interviewed by phone. General open-ended questions were developed to gain insight in the targeted research areas. The objective of the interview process was to obtain an individual perspective of the Business Success Model as hypothesized in this study. To avoid influencing the respondents' perceptions of the success factors, we did not raise the variables of interest.

1.	Our records show that you received a Phase 2 award for Topic Call N…-…, "………………….."". Have you gone to Phase 3 or sold the technology to a military or commercial client?
2.	Our records show that your company has won … Phase I awards and … Phase II awards. Is that correct? To what do you attribute your firm's success?
3.	I see that your firm started in year ……. Was that associated with an SBIR award, or was your company established when you won your first SBIR award?
4.	Our records show that your firm has about ….. employees. Can you estimate how many have a military background? If you do have military staff, did that help you market your technology to the military?
5.	Did your firm experience any challenges or difficulties associated with your participation in the SBIR program? If so, how could they have been relieved?
6.	What do you think are the characteristics of a successful topic call?

Table 2   Questions Used in the Questionnaire

Interviews were conducted and recorded with a confidentiality clause to facilitate an open discussion in response to the questions. Upon transcription, the participants' and company names were removed from the data. Our goal was to garner an open and personal perspective of the firms' SBIR experiences in the NAVAIR/Firm organizational

environment. The targeted areas of research aided in creating a protocol that guided the interviewee in discussing his or her own perceptions regarding the SBIR business environment. A hand-held digital recorder was used to record each interview and to ensure an accurate transcription.

C. DATA ANALYSIS

Our method was thematic analysis. The work was done based on existing theory and steps that are commonly used in this qualitative research.

A thematic analysis focuses on identifiable themes and patterns of living and/or behavior. The first step is to collect the data. Audiotapes should be collected to study the talk of a session or of an ethnographic interview. From the transcribed conversations, patterns of experiences can be listed. This can rely on direct quotes or paraphrasing common ideas. The next step in a thematic analysis is to identify all data that relate to the already classified patterns. All of the commentary under the specific pattern is identified and placed with the corresponding pattern. The next step to a thematic analysis is to combine and catalogue related patterns into sub-themes. Themes are defined as units derived from patterns such as "conversation topics, vocabulary, recurring activities, meanings, feelings, or folk sayings and proverbs". Themes are identified by "bringing together components or fragments of ideas or experiences, which often are meaningless when viewed alone." Themes that emerge from the informants' stories are pieced together to form a comprehensive picture of their collective experience. The coherence of ideas rests with the analyst who has rigorously studied how different ideas or components blend meaningfully when linked together.

When gathering sub-themes to obtain a comprehensive view of the information, it is easy to see a pattern emerging. When patterns emerge, it is best to obtain feedback from the informants about these patterns. This can be done as the interview is taking place or by asking the informants to give feedback from the transcribed conversations. In the former, the interviewer uses the informants' feedback to establish the next questions in the interview. In the latter, the interviewer transcribes the interview or the session and asks the informants to provide feedback that is then incorporated in the theme analysis.

The next step is to build a valid argument for choosing the themes. Once the themes have been collected and the literature has been studied, the researcher is ready to formulate theme statements to develop a story line. When the literature is interwoven with the findings, the story that the interviewer constructs is one that is coherent with the input.[27] (Aronson J., 2004)

Following the above method the analysis began by transcribing the interviews. Next, we identified important comments from each interview that described variables significant to our hypothesis. These were combined under similar themes and documented for further analysis. (See appendix A) This analysis was then used to identify the variables that represent the main factors leading to the success in NAVAIR's SBIR program.

Part of the data defining the companies was tabulated into a spreadsheet, which identifies key aspects such as demographics, success factors, challenges and concerns.

These aspects are the most important characteristics of the firms that serve as a basis to compare the similarities and differences between the firms. The team used them to build a perspective of the collective opinions.

D.   CONSTRAINTS

Naturally, the study team encountered some constraints. For instance, it was a challenge to address the broad scope of this study and to compile and collate the amount of material gathered in the short time available. The literature review, along with the interviews, generated a significant amount of useful material.

The study probed into an area of inquiry that is sometimes sensitive and company classified and for that reason particular care was taken to protect the participants' confidentiality. As there was an absence of any available indicators to assess what constitutes successful business ventures in the SBIR program, this study relied on the interviewees' perceptions. The conclusions were derived from the participants' responses.

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[27] Aronson J., "A Pragmatic View of Thematic Analysis." *The Qualitative Report*, Volume 2, Number 1, Spring, 1994. Retrieved on June 08, 2004 from http://www.nova.edu/ssss/QR/BackIssues/QR2-1/aronson.html

V.   ANALYSIS OF RESULTS

A.   GENERAL DESCRIPTION OF THE RESULTS SPREADSHEET

The conducted interviews served as the basis for producing a result spreadsheet used to systemize our observations, which lead to our conclusions from the research.

To make it confidential we removed the names of the companies and managers who were interviewed, as well as other specific details that could reveal the identities.

After the transcription of the interviews, a spreadsheet table was produced. The columns of Table 3 are explained below.

Company, technology and strategy	Start with SBIR?	No of Employees	No of Mil. Employees	Mil. Or Commercial market	Reach Phase III/Commercial Experience	Success Factors	Topic Calls	Problems w/ SBIR	Additional Suggestions
Company A Research & Commercial Company	No.	30 to 10	3 No big deal	75% gov.	Yes (1998 topic call)	Specialized, Technology Innovation	NAVY needs specific solution (NAVY expectations) not to state the problem.	No one wants the technology	TPOC – afraid, have to persuade – make TC more attractive to NAVY. Tell us "who want it? "
Company B Research & Commercial Company	No.	45	None. "Most of the employees are w/ PhD. "	Sales 70% mil./gov., 30% commercial.	No (1998 topic call), Yes (other topic calls)	Specialized. Technology. Innovation Persistence Communication	Too broad. Prefers narrow TC with focus but w/out describing the solution.	COTAR not an end user. Don't know who the sponsors are.	Don't know who the end user is? Who is to use it?
Company C Research Company	No.	115	2 "Not significant."	Majority mil./gov. contracts	No (1998 topic call), Yes (other topic calls)	Good research. Innovation	N/A	Requires a lot of research a lot of engineering and a lot of marketing.	Don't know who the end user is? Who is to use it?
Company D Commercial Company	No.	100	Yes. Not specific number. "Could be helpful."	N/A	No (1998 topic call), Yes (other topic calls)	Technology. Knowledge. Innovation	Specific solution (NAVY expectations)	No	No support to go to Ph. III. No awards for Ph. III.
Company E Research Company	No.	15	1 "Important"	N/A	Yes (1998 topic call)	Innovative technology Well positioned for transition	If it's broad it becomes difficult to defend what we really intend.	No	The reviewer comments should be more detailed.

Table 3   Observed Results from the Conducted Interviews

Column one is the company identifier (A, B, etc.) and contains a short description of the company's strategy (Research and/or Commercial).

Column two has information indicating whether the firm started with the SBIR program. The third column contains data about the number of employees. The forth column refers to the number of employees who had military background, and if it was significant to the firm to achieve success in the SBIR program. The fifth column presents data about the firms' share in the military and commercial market. In the sixth column, the information is whether the firm reached Phase III with a particular topic call, or if it received any Phase III awards at all. The seventh column contains information on the reasons the firms are successful in working with the SBIR. The eighth column contains opinions about the topic calls in the SBIR program. The ninth column explains the managers' opinions on what causes problems in achieving Phase III. The last column includes extra information as to the reason the firms have troubles achieving Phase III and also contains brief suggestions.

In our literature review five variables were identified that might contribute to military business success. Because our questions were open and did not seek to direct the responses, during the interviews not all of the companies provided a detailed explanation of the theoretically identified success variables. The levels of innovativeness, communicability, market orientation and learning orientation were addressed differently in the small sample of five firms.

Despite the subjectivity of a small research sample of five companies, the general observations reveal similarities in the attitude and the incentives among the respondents.

The data compiled from the interviews and assembled in table 2 can be summarized and analyzed therefore as a part of four main areas:

1.   Demographics;

2.   The firms' explanation of success;

3.   Challenges of working with SBIR;

4.   Suggestions by the firms to improve the SBIR system.

1.   **Demographics**

As described in Methodology, the interviewed companies received Phase I and II awards in 1998. The interviewed companies were started between 1985 and 1993. This means that the companies were from five to 13 years old at the time they received the awards in 1998. Most of them, however, had received previous SBIR awards. Some firms had a lot of experience in being awarded SBIR grants and some were relatively new to the program. The size of the companies varied from 10 to 115 workers. A common feature was that none of the firms actually started with an SBIR topic call, although some were only one or two years old at the time when they received their SBIR award.

Two of the companies can be identified as research and commercial firms, two as basically research companies and one as a predominantly commercial firm.

Some of the companies still remain within the category of small business and participate in the SBIR, while others have significantly grown or have been acquired and are no longer eligible for the program.

The companies in this survey reported a small percentage of employees or none with military background. In one company ten percent of the employees had some military background, while in others there was no military background or it was not considered to be significant.

2.   **The Firms' Explanation of Success**

During the interview, the firms were asked to comment on what factors attributed to their success in SBIR. Most of the firms noted the following:

1.   Selecting a proper topic call and writing a good proposal.

2.   Being specialized and having the technology.

3.   Being persistent.

a.   ***Selecting the Right Topic Call and Writing a Good Proposal***

Especially in Phase I, success was attributed to the company's knowledge of how to write a good proposal. This is one of the issues mentioned by most interviewees. Here is an example:

For other companies, the Phase I is just another report or feasibility study. You spend all this money to get a better proposal. For us with the proposal we built a prototype. So you get something for your money instead of just a promise. I think a lot of it is experience in writing proposals and company knowledge on how to write a good proposal… The big investment is writing the proposal during Phase I. There is not a big risk going from Phase I to Phase II. The risk is all in Phase I. It is a firm, fixed price. You got to use money to go to Phase II. (Company B)

b. *Being Specialized and Having the Technology*

The advantage of being specialized was expressed by two of the companies:

Well, we were specialists in a particular area in …… systems.
(Company A)
I think that we are kind of unique in this. Over time we got a good reputation on this. (Company B)

c. *Persistence*

One of the companies noted that they continued and reached Phase III due to the personal quality of being persistent:

The reason I got to Phase III is through personal persistence.
(Company B)

d. *Military Background*

The analysis shows that three respondents have employees with military backgrounds, while the others do not have any. Our observations are that having employees with military background does not have any significant impact on the success of the company in working with the SBIR. This is because most of the firms are R&D companies, and they have either their own marketing strategies or rely on marketing from the SBIR office. But on the other hand, they had to cooperate with people from the military, and one of the managers from a research firm expressed his frustration caused by the different organizational culture:

But I deal with a lot of people and firms with many ex-military. I feel like an outsider. (Company B)

We figured out from the interviews that all the companies do not consider having people with military background in the companies important in being successful in the SBIR program. Most of the companies are successful because they have a lot of experience in the SBIR:

Our experience comes from working with contracting for, you know, 15 years with the military market place. So we had people who've been working on military programs because they've been using our technology for all these years. And the people who have been around long enough have an experience with the market but not because they got it from the military side. (Company D)

At the same time people with military backgrounds are appreciated because they facilitate the communication with the military.

The lack of such a background in the company frustrates some of the people in their contacts with similar ex-military employees in other companies. The idea that such employees can help market the new products is also expressed.

Half of our men are PhDs and it is hard to find PhDs from the military. Half of our job is finding who needs the tools that we had built. We build tools and if we had men from the military we would know who needs them. (Company B)

A military background is also appreciated by the companies for consulting but not all of them could afford this or had the opportunities to use it:

If we had people with military background, then we could get more contacts. (Company B)

We use consulting with people who have military experience. We probably should have a Washington office and hire retired military. (Company C)

We are not going to hire generals out of D.C. We can't even think about that. We've never been a company that could do that. (Company D)

It works for both of those parties. I think it could work for us. We just didn't have the opportunities to put it to work for us. (Company E)

e. *Firm Success Strategies*

Companies have their own strategies to commercialize the products developed by the help of the SBIR program:

This strategy is once the product gets to commercialization stage, we spin it off, we create a new company to take that and commercialize it. (Company C)

This is in accordance with what the ABCs of SBIR says about the commercialization of the final SBIR products.[28] (ABCs of SBIR web page, 2004)

Another way out of the difficult situation is using consultants for the marketing:

For a small company we cannot have too many men or a pool of consultants from the various branches. (Company B)

3.   Challenges of working with SBIR

a.   *SBIR Positive Statements*

NAVAIR's SBIR program and its part in collaborating with the NAVY is considered more beneficial compared to the Army, Air Force and other services. Here is an example:

We are bidding with ARMY, AIR FORCE and my recollection of the NAVY better than the others. (Company A)

The company appreciates the cooperation with the general NAVAIR's SBIR manager Carol Van Wyk:

We know Carol and she knows us and we appreciate the program. (Company C)

Experience with SBIR is considered as great:

I don't really think bad stuff. Our experience with the SBIR program is just awesome. Free money! My goodness! You come and give me money for something I should be doing on my own. The SBIR program did an awesome thing. It made in the … company things to really exist that may not survive otherwise. (Company D)

SBIR is also appreciated for the possibility to sell product licenses and develop the product with the money from those licenses:

So from our business perspective in it – wishing to sell licenses to actually selling licenses. But when you are done with all these licenses, that is what makes the program so wonderful. The government gave you money what makes you have that product anyway. (Company D)

Work with SBIR is always a success:

When we work we provide success stories that can be published. (Company C)

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[28] Retrieved June 08, 2004 from
http://www.catalystconnection.org/news/pamanufactmag/pamanstory.cfm?id=76

Despite the difficulties there is a successful trend in completing SBIR topic calls:

Well, they were both difficult projects and you know we have technical problems. I think they were both completed quite successfully.
(Company A)

In terms of commercialization, our study showed that the majority of the sales belonged to the military and the government while the rest were within the industry. Commercialization that occurs in Phase III of the SBIR is initiated by the firms and much time is spent on finding end users who would use the technology. Marketing it to the buyers is another hurdle. But somehow with the Indefinite Delivery Indefinite Quantity contracts (IDIQ) introduced after the Phase II, these issues are pretty much resolved.

There were also perspectives that Phase III actually does not exist and theoretically it is not attainable. Another insight is that actually the SBIR does not actually provide financing after Phase II to reach Phase III and to commercialize the product.

b. *Difficulties in Affording Enough Research, Engineering and Marketing in a Small Company to Reach Commercialization*

For most of the companies getting resources to commercialize is a challenge as Phase III is not actually funded by the government. As a solution, to this the companies admit that Phase III is funded by themselves. The rewards from Phase II make it possible for the commercialization to become a fact despite the lack of grants for Phase III from SBIR:

I mean phase III is unfunded by the government…The product was indeed commercialized so it's on the market now. So it is in the Phase III.
(Company A)
They just did not wanna spend their money on that. It's not a priority to the program to fund that development at that level… You may qualify for Phase III but there is nobody there to put the money for Phase III. We funded Phase III ourselves with the reward of Phase II – the licenses.
(Company D)

Sometimes commercialization was done to other organizations different from the military:

Commercialization was to other organizations. I don't think we have ever sold to the military. Maybe we have one sale to a military contract.
(Company A)

As a reason for the companies to seek commercialization out of the SBIR environment some companies pointed out that there is no encouragement from SBIR for the created products and basically there is a perceived lack of desire to buy them:

You developed this wonderful product and overcome technical challenges and they really don't want to use it. And that just happens over and over again. (Company A)

Lots of companies do good work and when they give it to the COTAR that's it, no follow up is done… Essentially there is somebody who runs the contract. No vested interest whether the project is succeeding or not. They are not interested if the topic calls goes up to Phase III.
(Company B)

Despite the criticism about the stimuli in the SBIR program, some companies say that two-thirds of the prototypes are usually commercialized for one of the companies:

Two-thirds of the time something commercialized comes out of what we build. (Company A)

b. Phase III Not Quite Clear As a Definition and Objective to be Reached

The analysis shows that it is not clear for the companies what Phase III is, mainly because awards exist only until reaching Phase II:

I wonder what Phase III is! Essentially, do you know what the definition of Phase III is? (Company B)

I was never going to face Phase III on any of them… Phase III was seen unattainable… Just got the impression that Phase III didn't really happen… Now I don't know about that Phase III if it's working but does anybody have Phase III? (Company D)

While some of the companies only wonder what Phase III means, others stress that Phase III does not really exist:

Essentially, do you know what the definition of Phase III is?
(Company B)

My way of looking to it – Phase III doesn't exist. At the SBIR program it's just Phase II that is all that you get. And once you are done with Phase II and if you are successful and if you are already a product business, you can afford to go forward and fund Phase III yourself… Now I don't know

about that Phase III if it's working but does anybody have Phase III?
(Company D)

One of the participants in the interviews manages to give a very good explanation about the real reasons for not knowing Phase III. In his opinion there are no indicators from SBIR that you have reached Phase III and also no lessons learned:

No surveys are called for Phase III. I am not so familiar with that. There's nothing that says now you are in Phase III, so fill in the survey. There's nothing about lessons learnt or how do you get to Phase III, what you do right or things like that. The only thing you can write is the success story from Phase II. (Company B)

Part of the reason for companies to neglect Phase III is the fact that they may qualify for Phase III but despite that SBIR provides no funding for this:

You may qualify for Phase III but there is nobody there to put the money for Phase III… You need help at Phase III to get there. (Company D)

I mean phase III is unfunded by the government. (Company A)

Funding is the most important stimuli for companies to have the right perception toward Phase III. As they do not receive any funding for this phase, they do not actually realize that something happens after Phase II. And the main reason to get to Phase III as we mentioned already is personal persistence. Not much is done from SBIR to take them to this phase:

The reason I got to Phase III is through personal persistence. No matter what good work we did today if there not used when I am done with it, it will get lost. Let me build something you will use today. (Company B)

c. Criticism of the Evaluation Process within SBIR

Substantial criticism of the evaluation process exists about the rejection of some of the topic solutions. This criticism could address the reviewers who evaluate the proposals:

I mean how he came to that conclusion that it wasn't preferred solution as he put everything to think of and rejected all excepted the one he preferred. So you are then wasting your time if you are not bidding a preferred solution. (Company A)
The worst thing is the proposal to be rejected and not to know why. (Company E)

According to a respondent, there are errors in delivering awards by SBIR, which is frustrating the companies:

The error is they tend to make awards to people who understand the problem rather than people who understand solution. (Company A)

Another error is the lack of scope. Too much is required for insufficient finance and time:

The problem is certainly solvable but is not solvable for 100K in nine months. Big companies like ... are working on this for millions of dollars ever and ever. It is completely out of scope for SBIR. So the only way you can possibly win things is not to recognize that you are out of scope. (Company A)

Despite the stated errors there is a desire from the firms for SBIR to do more in Phase II to further commercialize the invented prototype:

We wish we could do more in the phase II to commercialize them. (Company B)

d. Disconnection with the Military End User of the Developed Product/Technology

A very substantial drawback is considered the disconnection of the military with the end user of the product:

There is disconnection between research parts of the military and the user parts. (Company A)

One of the main reasons for the disconnection is that the COTAR does not always know the end user:

The COTAR or referred to as contracting officer, the one who you deal with are the client but they are not the customer or the end user. If you ask him who would use the product he would not know this. (Company B)

e. Lack of Consistency in the SBIR's Approach to Companies

Firms perceive that it is not a priority for SBIR to fund the development of technologies that can be used globally across the whole industry:

They say in SBIR 'You know, why is it that our program budget should take ahead for you to develop a technology that will be used globally across the whole industry?'
And you know they basically can't wait until our competitors develop the technology. It's not a priority to the program to fund that development at that level. (Company D)

Phase I and II are considered good, but Phase III does not work well:

But the SBIR program didn't incentivize somebody else to give us the money to finish Phase III. And if that was the intent, it didn't work. If the intent was Phase I and II were good enough – it did work. (Company D)

Processing time is perceived as acceptable, although sometimes companies are not aware of whether they have won or not in the competition at one of the phases:

Processing time is acceptable despite the fact that sometimes we are not aware whether we won or not. (Company E)

f.   *Topic Calls*

Two major problems for the firms relate to topic calls. One problem is the scope of the topic call. The second is contacting the right person to clarify the topic call.

(1) Topic Scope. The topic calls are sometimes described as too broad. (See Appendix B) Respondents preferred narrow topic calls without a description of the solution. One of the respondents mentions that some of the topic calls are too broad and the firm prefers a narrow focus without a solution:

Ten years ago topic calls were broader... If the proposing topic writer has a solution in mind, he will tend to reject everything that is not the preferred solution. I mean how he comes to that conclusion that it wasn't preferred solution? He put everything to think of, and rejected all except the one he preferred. So you are then wasting your time if you are not bidding the preferred solution and I think the topic call makes you really hesitate. (Company A)

Another respondent agrees about the difficulties presented by broad topic calls:

Both the narrow and the broad ones are depending upon who is doing the evaluation and so this is helpful when there is a point of contact that can lead to a discussion with the reviewers that are present and say this is what I intended. And if it's a broad one, it becomes very difficult to defend what we really intended. A broader net can catch more fish, so it's good to know the fish don't get through the net though. (Company E)

Most interviewees describe some topic calls from the military as a good example. If the topic calls are too broad the solution provided could be very different from what is proposed. An example is quoted where the firms could talk to the

technical point of contact (TPOC) to clarify vague issues in the solicitations. If the solicitations are vague the firm's solution offered could be wrong. If the firms do not contact the TPOC, then they could look at the wrong problem and recommend the wrong solution.

A good topic call should be specific – there should be a need for it and it should not be a preferred solution specified by SBIR:

> *If a topic call is something for what there is a need and presumably that means there is a lack of solutions currently existing in the market and it's sort of at the right level to be viable for companies to take on.*
> (Company D)

> *Another thing is for the topic call to be specific enough, so that somebody can write to it and know that they are on the topic or not so that they not spend time to find out after some years that the topic call was written too vaguely and it's not exact which is something which happens most of all probably to everybody, I'm sure.* (Company E)

(2) Topic Call Contacts. The second major problem with topic calls is that the companies are not allowed to contact the program managers about technical problems. They can contact only the topic call authors. Sometimes the topic authors could not be found within the points of contacts written in the topic call documents. They are to be found on other solicitation web pages and there is only a short period when companies can ask questions to clarify certain topic calls. They are not allowed to do that after the time expires and at the same time topic call authors could be reassigned and be difficult to find again. (See Appendix)

There is a turnover in the program as people are rotated every year and new persons are not quite aware of what has been done on a specific topic call in the past.

> *But I would think it takes a long time for SBIR out from the solicitations, four to five years later that person is gone, people gets rotated every year.*
> (Company B)

Another problem is that some of the topic calls underestimate the time and funds that are necessary to finish them. This is what one of the respondents said:

> *Tell us how you can do that for 100K in nine months? That particular topic has been awarded half a dozen times and the condition for getting the award is that you have to be in two places and you know that it is impossible. You know the problem is certainly solvable but is not solvable*

for 100 K in nine months. Big companies are working on this for millions of dollars ever and ever. It is completely out of scope for SBIR. So the only way you can possibly win things is not recognizing that you are out of scope. (Company A)

4.   Suggestions by the Firms to Improve the SBIR System

a.   *COTAR and TPOC Must Know the End User. More Background Information to be Given to Companies about the Players in the System*

The SBIR in its endeavor to facilitate the commercialization should stress who the end user will be in every solicitation. The contracting officer (COTAR), who acts as a client to the firms is not the end user who would use the final product of the SBIR topic call. Most of the time the COTAR did not know who would use the product or who would handle the program:

Who the players are and what their responsibility needs to be made known. The background of all these people needs to be known and if they are still available for contact. The sponsor who writes the solicitations should know who the end user and whether they still exist. (Company B)

Firms also raised issues on the lack of information from sponsor/offerer who initializes the solicitations, the COTAR who runs the contract physically and the technical point of contact (TPOC) to find out who could be the end user. The players and their responsibilities together with the background of all these people are also not known:

If you do not know the sponsor or end user then the SBIR should be cancelled. These need to be tracked down and if we lose them then the topic call should be thrown away. If we know the sponsors then we can confirm whether the technology is still required if the need is obsolete. There must be a checklist; a tracking system of who is the sponsor, who is the COTAR, who is the end user and these must be tracked. (Company B)

Without that it is not clear if bidders, sponsors who write the solicitations and the end users are still available for contact or still exist.

b.   *Help from the Military in Finding an End User would be Appreciated*

As much time is being spent finding the end user, it is proposed that the military could help in this effort:

The hard part is the effort put in to find end users who would use the end products after SBIR. Much time would be spent on this. The big business

decision is will we find some one to use the end product. If the military helps you in this then it is great. (Company B)

c. Feedback on the Reasons for Rejecting Proposals and More Detailed Reports

The reasons for rejection of proposals must be also reported to the firms:

The worst thing to do is the proposal to be rejected and not to know why.

(Company E)

Reports should be more detailed:

The reviews we got typically from DoD are not focusing on the NAVY per se but really just Army, Air Force… any other one would respond it. Particularly not more than one page. And most often time – maybe three to four sentences per category of something to respond to and I can appreciate three to four sentences of experience of the personnel or something like that but when the proposal is not accepted. (Company E)

d. Timely Response from SBIR in Order to Appropriately Use the Developed Technologies

Another recommendation concerns the appropriate use of technology and timely response:

I guess you need to have people to be able to respond in ways that they can actually do something with the technology. (Company D)

All these insights and recommendations could serve as a good starting point for improvement of the SBIR program and increase the chances of commercialization to achieve a Phase III award.

VI.   CONCLUSIONS

A.   DEMOGRAPHICS

A sample of five firms, large and small and having from 15 to 115 employees was used in this study. Overall, an average of ten percent of the employees have a military background. The majority of SBIR product sales made by the firms are to the military and government. All of the companies had achieved Phase III in at least one topic call.

B.   SUCCESS

Our findings reveal that firms do not believe that having employees with military backgrounds in their firms significantly improves the success of the firm working with the SBIR program. Thus having people with military backgrounds is not significant in being successful in the SBIR program even though such a background could be helpful in marketing to the military. It is the amount of good working experience with the military in the SBIR program that made the companies successful.

From the point of view of the companies' managers, the most important aspects which might lead to Phase I and Phase II of SBIR awards is the ability to select a right topic call and to write good proposals. They also say that being specialized and having the technology is critical to success. Finally, the persistence of the company is also crucial.

C.   CHALLENGES

Main difficulty for the companies is affording enough research, engineering and marketing efforts to reach commercialization.

The steps to Phase III are not clearly defined and the objectives are vague. It is believed by most firms that Phase III does not exist. This situation occurs when the SBIR provides no indicators that a particular company has reached Phase III. Even if the product is commercialized the company does not recognize that it has achieved Phase III.

Some firms feel that SBIR does not provide sufficient explanation of the reasons the firm's proposals were rejected during the program's evaluation process. Some firms commented that the topic calls are excessive with regard to the time and funds necessary to commercialize.

The disconnection of the military with the end user is the biggest challenge for the companies. This requires that the companies implement flexible strategies to find an end user and achieve successful commercialization.

Another challenge facing the firms in the SBIR program is that the topic calls are perceived to be sometimes too broad in scope.

One of our findings reveals that most firms perceive the military topic calls as good examples. In summary, the preferred topic call is specific, needed by an end user and no preferred solution.

D.   RECOMMENDATIONS FOR IMPROVEMENT

The recommendations here are based on the companies' opinions and on our insights for increasing the level of success in the SBIR program.

Topic calls must be stated more clearly with the end user identified but no preferred solution.

First, SBIR should offer an award to companies reaching Phase III. Secondly, the SBIR should promote the success of firms reaching Phase III. Third, the SBIR should also make every possible effort to help the firm identify the end users of the products.

More detailed reasons for rejecting the proposals must be reported to the firms. Every player in the SBIR program must be known, with their background and responsibilities included in a checklist or a tracking system created within the framework of the SBIR program.

The system of IDIQ contracts (Indefinite Delivery Indefinite Quantity introduced after the Phase II could be used as a vehicle for commercialization to assist firms achieve Phase III.

E.   RECOMMENDATIONS FOR FUTURE STUDY

This study was designed to gather qualitative data from firms participating in the SBIR program. Hence only a small sample of five firms was interviewed. Future research is needed to test these results. A quantitative study of the firms participating in the SBIR program is needed to determine if the opinions gathered in this qualitative study exist in the larger population of firms.

APPENDIX A.   MAIN THEMES IN THE CONDUCTED INTERVIEWS

Phase III not funded by the government.

I mean phase 3 is unfunded by the government (Company A)

They just did not wanna spend their money on that (Company D)

It's not a priority to the program to fund that development at that level. (Company D)

You may qualify for Phase III but there is nobody there to put the money for Phase III. (Company D)

Phase III funded by themselves.

We funded Phase III ourselves. (Company D)

We funded Phase III ourselves with the reward of Phase II – the licenses. (Company D)

Commercialization occurs but firms do not always apply for Phase III.

The product was indeed commercialized so it's on the market now so this is it in the phase III (Company A)

Two thirds of the time something commercialized comes out of what we build. (Company A)

Commercialization to organizations outside the military

I don't think we have ever sold to the military. Maybe we have one sale to a military contract.

(Company A)

No interest from SBIR in the new products.

You developed this wonderful product and overcome technical challenges and they really don't want to use it. And that just happens over and over again. (Company A)

Lots of companies do good work and when they give it to the COTAR that's it, no follow up is done. (Company B)

Essentially there is somebody who runs the contract. No vested interest whether the project is succeeding or not. They are not interested if the topic calls goes up to Phase III. (Company B)

It is not clear for the companies what Phase III is

I wonder what Phase III is! (Company B)

Essentially, do you know what the definition of Phase III is?

(Company B)

No surveys are called for Phase III. I am not so familiar with that. There's nothing that says now you are in Phase III, so fill in the survey. There's nothing about lessons learnt or how do you get to Phase III, what you do right or things like that. The only thing you can write is the success story from Phase II. (Company B)

I was never going to Phase III on any of them… Phase III was seen as unattainable. (Company D)

Just got the impression that Phase III didn't really happen.
(Company D)
Now I don't know about that Phase III if it's working but does anybody have Phase III? (Company D)

My way of looking to it – Phase III doesn't exist. At the SBIR program it's just Phase II that is all that you get. And once you are done with Phase II and if you are successful and if you are already a product business, you can afford to go forward and fund Phase III yourself…Now I don't know about that Phase III if it's working but does anybody have Phase III? (Company D)

Bigger part of the success in SBIR is the process of writing a good proposal

You spend all this money to get a better proposal. For us with the proposal we build a prototype. So you get something for your money instead of just a promise. I think a lot of it is experience in writing proposals and company knowledge on how to write a good proposal. (Company B)

The big investment is writing the proposal during Phase I. There is not a big risk going from phase I to Phase II. The risk is all in Phase I. It is a firm fixed price. You got to use money to go to Phase II. (Company B)

Once I have the idea how to propose, that might have been better. But the way that the topic call was written I would think of how to give them a response. (Company E)

Criticism of the evaluation process that rejects some of the topic solutions

I mean how he came to that conclusion that it wasn't preferred solution as he put everything to think of and rejected all except the one he preferred. So you are then wasting your time if you are not bidding a preferred solution. (Company A)

And the goal above all this thing, I think was to have the government spend so much money in ways that will do outlasting results instead of the short-term results given to an integrator who integrates it behind a secret wall and then nobody uses it again. (Company D)

The worst thing to do is the proposal to be rejected and not to know why.

(Company E)

Phase III seems unattainable. Firms feel they need help to reach Phase III.

Phase III was seen as unattainable. (Company D)

You need help to get to Phase III. (Company D)

The main reason to get to Phase III is personal persistence. Not quite enough was done from SBIR to take them to this phase.

The reason I got to Phase III is through personal persistence. No matter what good work we did today if there not used when I am done with it, it will get lost. Let me build something you will use today. (Company B)

Adjustment over the years speaks about good learning orientation

Yes I think we have adjustment over the years (Company A)

Expertise in a specialty is considered as an advantage.

Well, we were specialists in a particular area in ……systems.

(Company A)

I think that we are kind of unique in this…Over time we got a good reputation on this. (Company B)

Successful trend in completing SBIR topic calls despite the difficulties

Well they were both difficult projects and you know we have technical problems. I think they were both completed quiet successful. (Company A)

Employees with military background.

Out of the 30 how many were military?

Not a lot I think we have 3. (Company A)

Half of our men are PhDs and it is hard to find PhDs from the military.

But I deal with a lot of people and firms with many ex military. I feel like an outsider. (Company B)

Half of our job is finding who needs the tools that we had built. We build tools and if we had men from the military we would know who needs them. (Company B)

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Military background appreciated but not largely used.

If we had that people with military background then we can get more contacts. (Company B)

We use consulting with people who have military experience. We probably should have a Washington office and hire retired military. (Company C)

We are not going to hire generals out of D.C. We can't even think about that. We've never been a company like I said that could do that. (Company D)

...It works for both of those parties. I think it could work for us. We just didn't have opportunities to put it to work for us. (Company E)

Good experience working with the military is more important than military background.

Our experience comes from working with contracting for, you know, 15 years with the military market place. So we had people who've been working on military programs 'cause they've been using our technology for all these years. And the people who have been around long enough have an experience with the market but not because they got it from the military side. (Company D)

Errors in delivering awards by SBIR

The error is they tend to make awards to people who understand the problem rather than people who understand the solution. (Company A)

TPOC necessary to clarify some of the vaguely written topic calls

In the military you could talk to the point of contact to confirm things. Sometime the solicitations are written very poorly and the solution offered could be wrong. If we did not contact the TPOC, then we would only competing with the people who called him. (Company B)

Characteristics of a good topic call according to the firms

If a topic call is something for what there is a need and presumably that means there is a lack of solutions currently existing in the market and it's sort of at the right level to be viable for companies to take on.

(Company D)

Ten years ago topic calls were broader. (Company A)

Both the narrow and the broad ones are depending upon who is doing the evaluation and so this is helpful when there is a point of contact that can lead to a discussion with the reviewers that are present and say this is what I intended. And if it's a broad one, it becomes very difficult to defend

what we really intended. A broader net can catch more fish, so it's good to know the fish don't get through the net. (Company E)

If you deal with company X, it would be broad, but I rather prefer a narrow focus but without a solution topic call. That is where we will provide the solution, which is better. (Company B)

Another thing is for the topic call to be specific enough, so that somebody can write to it and know that they are on the topic or not so that they are not spending time to find out after some years that the topic call was written too vaguely and it's not exact - something which happens most of all probably to everybody. I'm sure. (Company E)

The scope is too broad. Too much is required for insufficient funding and time

The problem is certainly solvable but is not solvable for 100K in nine months with big companies like Lockheed working on this for millions of dollars forever and ever. It is completely out of scope for SBIR. So the only way you can possibly win things is not to recognize that you are out of scope. (Company A)

Desire to do more in Phase II to further commercialize the prototype

We wish we could do more in the phase II, to commercialize them.

(Company B)

Need help from SBIR to find an end user.

Firstly the COTAR (contracting Officer) should know if someone who wants to use the technology. Much money is spent in this SBIR. So they must find a client or end user. We could build something that at phase II we could hand over for use but when we gave it to them it was not used. (Company B)

The hard part is the effort put in to find end users who would use the end products after SBIR. Much time would be spent on this. The big business decision is will we find someone to use the end product. If the military helps you in this, then it is great. We look for similar type topics to help us win future business. Hopefully we could build future training systems more efficiently after past experiences. (Company B)

COTAR doesn't know the end user.

The COTAR or referred to as contracting officer, the one who you deal with are the clients but they are not the customer or the end user. If you ask him who would use the product he would not know this. (Company B)

There is disconnection between research parts of the military and the user parts. (Company A)

The players in SBIR must be known with their background and responsibilities.

But I would think it takes a long time for SBIR out from the solicitations, four to five years later that person is gone, people gets rotated every year. (Company B)

Who the players are and what are their responsibilities need to be made known. The background of all these people needs to be known and if they are still available for contact. The sponsor who writes the solicitations should know who the end users are and whether they still exist.

 (Company B)

If you do not know the sponsor or end user, then the SBIR should be cancelled. These need to be tracked down and if we lose them then the topic call should be thrown away. If we know the sponsors then we can confirm whether the technology is still required if the need is obsolete. There must be a checklist, a tracking system of who is the sponsor, who is the COTAR, who is the end user and these must be tracked. (Company B)

Reports to be more detailed.

The reviews we got typically from DoD are not focusing on the NAVY per se but really just the Army, Air Force… anyone would respond to it. Particularly not more than one page. And most often time – maybe three to four sentences per category of something to respond to and I can appreciate three to four sentences of experience of the personnel or something like that. (Company E)

Difficulties for a small company.

It requires a lot of research to move to commercialization, a lot of engineering and a lot of marketing. And that's difficult for a small company. (Company C)

Experience with SBIR is great.

I don't really think bad stuff. Our experience with the SBIR program is just awesome. Free money! My goodness! You come and give me money for something I should be doing on my own. The SBIR program did an awesome thing. It made things really exist that may not survive otherwise. (Company D)

So from our business perspective in it – wishing to sell licenses to actually selling licenses takes time. But when you are done with all these licenses that is what makes the program so wonderful the government gave you money that makes you have that product anyway. (Company D)

Strategy for commercialization

The strategy is once the product gets to commercialization stage, we spin it off, then create a new company to take that and commercialize it. (Company C)

Consultants are being used for marketing.

For a small company we cannot have too many men or a pool of consultants from the various branches. (Company B)

If we had somebody in military, when we build tools today and probably need the contact people with the military. If we had that people with military background then we can get more contacts. (Company B)

The company appreciates the cooperation with Carol Van Wyk.

We know Carol and she knows us and we appreciate the program.

(Company C)

Work with SBIR is always a success.

When we work we provide success stories that can be published.

(Company C)

No desire to spend money from the military for transition to Phase III.

They just did not wanna spend their money on that. (Company D)

Not a priority of the SBIR to fund the development of technologies that can be used globally across the whole industry.

You know, why is it that our program budget should take ahead for you to develop a technology that will be used globally across the whole industry? And you know they basically can't wait until our competitors develop the technology. It's not a priority to the program to fund that development at that level. (Company D)

Phase I and II are OK but Phase III didn't work from SBIR's part.

But the SBIR program didn't incentivize somebody else to give us the money to finish Phase III. And if that was the intent, it didn't work. If the intent was Phase I and II were good enough – it did work. (Company D)

SBIR necessary with the grants just to develop the technology.

...in fact our goal to have that SBIR in order to leverage that money and get us to that point where we get proven that technology and meet it. (Company D)

The reasons for rejection of proposals must be reported to the firms.

> *The reviews we got typically from DoD are not focusing on the NAVY per se but really just Army, Air Force… any other one would respond it. Particularly not more than one page. And most often time – maybe three to four sentences per category of something to respond to and I can appreciate three to four sentences of experience of the personnel or something like that but when the proposal is not accepted.* (Company E)

Processing time is acceptable.

> *Processing time is acceptable despite the fact that sometimes we are not aware whether we won or not.* (Company E)

APPENDIX B. SAMPLE OF A TOPIC CALL NOT RELATED TO THE QUESTIONED FIRMS

N03-162   TITLE: <u>Non-Woven Textile Technologies</u>[29]

TECHNOLOGY AREAS: Materials/Processes, Human Systems

ACQUISITION PROGRAM: ACAT IV: PM Infantry Combat Equipment, ICE

OBJECTIVE: The primary goal of this initiative is to use non-woven fabric technology to increase performance and reduce lifecycle costs of combat clothing and equipment.

DESCRIPTON / BACKGROUND: While textile technologies have made significant improvements in recent years, the capability of the U.S. Industry to develop and compete new technologies and manufacturing processes has decreased. Only a handful of manufacturers currently exist. The majority of military clothing and equipage items currently use woven fabric and some knit technology. Non-wovens appear largely as a base for fusible applications. However, non-woven fabrics can be used to reduce labor and manufacturing time while improving durability and comfort at a cost savings. Also non-wovens could provide additional competition for the military to acquire base fabrics for either field launderable clothing (Battle-Dress-Uniforms, Rainsuits, Chemical Protective Uniforms, etc) and equipage (backpacks, tentage, duffle-bags, sandbags, sleeping bags, etc.) applications and aid in fabrication of end-items through use of ultrasonics or other stitchless technologies. This SBIR will investigate unique non-woven materials or processes relative to their expected end-item application with increased performance properties and will transition into the manufacturing of garments/equipage items for use across the wide spectrum of environments in which Operating Forces are expected to perform.

PHASE I: Compare the technical merit of non-woven materials with the performance of current materials to include durability, air-permeability, chemical (CP), flame (FR), water-proofness (WP) and thermal resistance (TR) properties along with the capability for non-wovens to be dyed, printed and finished. Applications would include unique fiber blends and processes for non-woven production. Included may be State-of-the-Art spraying process that could lay fibers onto Three-Dimensional end-item mold to produce end-items using non-woven slurry. Base fabric guidelines for clothing fabric would be expected to possess a max. weight of 7 oz / square yard per American Society for Testing and Materials, (ASTM) D-3776, 5 lb min. tear strength per ASTM D-5734, 80 lb min Breaking Strength per ASTM D-5034, min. of 50 cu ft/ min/sq. ft. air permeability per ASTM 737. Also required would be soft hand and suppleness of resultant non-woven product for clothing application along with consideration of durability, launderability, abrasion resistance and other factors related to specific end-item application, i.e. Chemical Suits shall possess (CP), tentage shall possess FR & WP, rainsuits WP etc. Conduct limited laboratory testing to validate research in this area relative to end-item use. Identify materials with properties worth investigating in Phase II fly-off.

PHASE II: Produce enough of the selected materials identified in Phase I to conduct developmental testing and fabricate clothing / equipage end-items designed for each non-woven development. Material properties should be verified on swatches before producing clothing or equipment. Manufacturing issues will be documented to include fabric production, camouflage printing, seams, sewing or stitchless processes. All environmental type end-items shall have leak-proof seams. Prototype garments shall be produced for field evaluation. The results of the research, developmental testing and field evaluation will be documented in a technical report with conclusions on the utility of non-woven fabrics for various military applications.

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[29] Retrieved June 09, 2004 from http://www.nttc.edu/resources/funding/dod/sbir2003/navy032.htm

PHASE III: Non-Woven Textiles have applications to both military and civilian markets. Develop a Marketing Plan to develop a large enough consumer base to bring production cost down along with Web-Site denoting relationship between base non-woven structures combined with all related properties (FR, WP, CP, TR, etc) and end-item assembly processes.

COMMERCIAL POTENTIAL: This material and the garments produced have application across a wide spectrum of commercial environments including outdoor recreation (hunting, fishing, camping), sleeping bags, low cost rainsuits, temporary shelters, backpacks, etc.

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KEYWORDS: Non-Woven Fabric, Thermal Resistance, Permeability, and Flame Resistance

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